

CLAIMS

1. A method of generating data representative of a geographical network, using a database containing data representative of nodes and edges connected to such nodes, the nodes and edges being representative of the geographical network, and the method comprising the steps of:
 - (a) selecting data from the database relating to an extended junction, which junction comprises at least one node and at least one edge, and
 - (b) outputting the selected data.
2. A method according to Claim 1, wherein the step of selecting data comprises:
 - (i) selecting from the database a node which forms part of the extended junction; and
 - (ii) selecting from the database in accordance with predetermined criteria at least one edge which forms part of the extended junction and which is connected to the selected node.
3. A method according to Claim 2 wherein the step of selecting data comprises selecting an edge if the length of the edge is less than a predetermined length.
4. A method according to Claim 2 or 3 wherein the step of selecting data comprises selecting an edge in accordance with a related flag in the database.
5. A method according to any of Claims 2 to 4 wherein the step of selecting data comprises selecting an edge in accordance with data in the database which relates the edge with another edge that has already been selected.
6. A method according to any of Claims 2 to 5 wherein the step of selecting data comprises selecting an edge if the edge is an element of a road artefact such as a roundabout, dual carriageway or traffic island.
7. A method according to Claim 6 wherein the step of selecting data further comprises analysing the network adjacent to an edge to determine whether the edge is an element of a road artefact.

8. A method according to any of the preceding claims wherein the step of selecting data further comprises the step of selecting at least one node connected to any of the selected edges.
- 5 9. A method according to any of the preceding claims wherein the step of selecting data further comprises the step of selecting at least one edge connected to but not forming part of the extended junction.
- 10 10. A method according to any of the preceding claims, wherein the step of outputting the selected data comprises transmitting the selected data to a client device.
- 15 11. A method according to any of the preceding claims, further comprising the step of displaying the selected data on a handheld device, preferably in the form of a schematic.
- 20 12. A method according to any of Claims 2 to 11 further comprising selecting further data relating to a further extended junction by selecting a further node in the database, and identifying one or more further edges connected to the selected node and meeting the same or further predetermined criteria, and further outputting the further data relating to the further extended junction.
- 25 13. A method of processing data representative of a geographical network, which network is formed from nodes connected by edges, the method comprising selecting an edge, analysing the portion of the network adjacent to the selected edge to determine whether the edge is an element of an artefact; and processing the selected edge in dependence on the result of the analysis.
- 30 14. A method according to Claim 13 wherein the step of analysis comprises determining whether the configuration of the portion of the network adjacent to the selected edge satisfies predetermined criteria.

15. A method according to Claim 13 or 14 wherein the network is a road network, and the step of analysing the network comprises determining whether the edge forms part of a traffic island.
- 5 16. A method according to any of the preceding claims, further comprising processing the set of selected nodes and edges in accordance with a modification algorithm.
- 10 17. A method of processing data representative of a geographical network, the method comprising the steps of:
- a) retrieving the data from a database;
 - b) processing the data in accordance with a modification algorithm; and
 - c) outputting the processed data.
- 15 18. A method according to Claim 16 or 17 wherein the modification algorithm geometrically simplifies the data.
19. A method according to any of Claims 16 to 18 wherein the data includes a plurality of nodes, and the modification algorithm adjusts the relative positions
- 20 of the nodes.
20. A method according to any of Claims 16 to 19 wherein the data includes a plurality of edges, and the modification algorithm adjusts the relative angles between at least two such edges.
- 25 21. A method according to Claim 20 wherein the modification algorithm snaps the relative angles of at least two edges to one of a set of preferred angles.
22. A method according to Claim 20 or 21 wherein the modification algorithm
- 30 adjusts the relative angles of at least two edges to be parallel or anti-parallel.
23. A method according to any of Claims 16 to 22 wherein the modification algorithm includes the steps of:

- a) identifying preferable alignment relationships between different elements of the data; and
 - b) adjusting the relative positions of the elements so as to provide an arrangement which best satisfies the identified alignment relationships.
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24. A method according to Claim 23, the data including at least one node and at least one edge connected to the node(s) and being representative of at least one junction exit, and wherein the modification algorithm includes the steps of identifying at least one edge as a junction exit; identifying preferable alignment
- 10 relationships between the or each junction exit; and adjusting the relative positions and/or angles of the junction exits so as to provide an arrangement which best satisfies the identified alignment relationships.
25. A method according to Claim 23 or 24, further comprising computing a measure
- 15 of the strength of the alignment relationships in dependence on the similarity of the geometry of the elements to a predetermined relationship, such as a parallel or anti-parallel relationship.
26. A method according to any of Claims 16 to 25, the data including at least one
- 20 node and at least one edge connected to the node(s), and wherein the modification algorithm preserves anti-parallel relationships between pairs of edges in preference to parallel relationships between pairs of edges.
27. A method according to any of Claims 16 to 26, the data including at least one
- 25 node and at least one edge connected to the node(s), and wherein the modification algorithm includes the steps of identifying one or more of said edges as junction exits; and grouping the junction exits into clumps of junction exits which can be displayed as emanating from the same point.
- 30 28. A method according to Claim 27 wherein the modification algorithm attempts to minimise the number of clumps.

29. A method according to any of Claims 16 to 28 the data including at least one node and at least one edge connected to the node(s), and wherein the modification algorithm includes the steps of:
- a) identifying one or more of said edges as junction exits;
 - 5 b) determining the angle of each of the junction exit(s); and
 - c) modifying the data in accordance with the angle(s) of the junction exit(s).
30. A method according to Claim 29 wherein the junction exit is defined by a series of polyline segments at different angles, and the angle of the junction exit is
10 determined by analysing the polyline segments to determine a representative angle.
31. A method according to any of the preceding claims, wherein outputting the selected or processed data comprises outputting the data as graphical data,
15 preferably in the form of a graphical schematic.
32. A method according to Claim 31 wherein the modification algorithm aligns the graphical data with a selected screen geometry.
- 20 33. A method according to any of the preceding claims, further comprising the steps of: receiving route data defining a route as a set of nodes; computing a measure of the significance of one such node; and processing the route data in accordance with the computed significance.
- 25 34. A method of processing data representative of a geographical network, comprising the steps of: receiving route data defining a route as a set of nodes; computing a measure of the significance of one such node; and processing the route data in accordance with the computed significance.
- 30 35. A method according to Claim 33 or 34, wherein computing a measure of the significance of a node comprises classifying the node as one of significant and insignificant.

- 5 36. A method according to any of Claims 33 to 35, wherein computing a measure of the significance of a node comprises retrieving a first parameter associated with a first edge connected to the node and a second parameter associated with a second edge connected to the node; and comparing the first and second parameters.
- 10 37. A method according to Claim 36, wherein the first parameter comprises a classification associated with the first edge and the second parameter comprises a classification associated with the second edge.
38. A method according to Claim 36 or 37, wherein the first parameter comprises a road name associated with the first edge and the second parameter comprises a road name associated with the second edge.
- 15 39. A method according to any of Claims 33 to 38, further comprising segmenting the route into a plurality of route segments in accordance with said computed significance.
- 20 40. A method according to any of Claims 33 to 39, comprising computing a measure of the significance of each of a plurality of such nodes.
41. A method according to Claim 40, comprising segmenting the route into a plurality of route segments in accordance with said computed significances.
- 25 42. A method according to any of Claims 33 to 41, comprising segmenting the route into a plurality of route segments, wherein segmenting the route comprises generating a route segment bounded by two significant nodes.
- 30 43. A method according to any of Claims 33 to 42, comprising segmenting the route into a plurality of route segments, the route having a start node and an end node, and wherein segmenting the route comprises generating a plurality of route segments each bounded by two significant nodes or by one significant node and one of the start and end nodes.

44. A method according to any of claims 33 to 43, comprising segmenting the route into a plurality of route segments, further comprising further segmenting one of the plurality of route segments if the segment exceeds a pre-determined length.
- 5 45. A method according to any of claims 33 to 44, comprising segmenting the route into a plurality of route segments, further comprising further segmenting one of the plurality of route segments if the segment comprises more than a pre-determined number of insignificant nodes.
- 10 46. A method of providing a graphical schematic of a location, the method comprising the steps of:
- a) selecting one or more of points of interest from a database in accordance with a predetermined selection algorithm;
 - b) generating a graphical schematic including the selected points of interest; and
 - 15 c) outputting the graphical schematic generated in step b).
47. A method according to Claim 46 wherein the algorithm includes the steps of:
- a) ranking a plurality of points of interest; and
 - b) selecting one or more of the points of interest in accordance with their rank.
- 20 48. A method according to Claim 46 or 47 wherein the algorithm includes the steps of:
- a) retrieving one or more stored parameters associated with each point of interest; and
 - 25 b) selecting one or more of the points of interest in accordance with their associated stored parameter(s).
49. A method according to any of Claims 46 to 48 wherein the selection algorithm comprises the steps of:
- 30 a) selecting a location; and
 - b) selecting one or more points of interest within a predetermined radius of the selected location.

50. A method according to any of Claims 46 to 49 wherein the database includes a plurality of nodes and the selection algorithm includes the step of:
- a) selecting a node;
 - b) defining a region surrounding the node; and
 - 5 c) selecting points of interest within the defined region.
51. A method according to Claim 50 wherein the step of defining a region surrounding the node comprises defining a circular region centred on the node.
- 10 52. A method according to any of Claims 46 to 51 wherein the selection algorithm selects one or more of points of interest from the database in accordance with the visibility of the points of interest.
53. A method according to any of Claims 46 to 52 wherein the selection algorithm
15 selects one or more of points of interest from the database in accordance with the time of day.
54. A method according to any of Claims 46 to 53 further comprising storing a list
20 of favourite points of interest associated with a particular user, wherein the selection algorithm preferentially selects points of interest stored in the list.
55. A method according to any of Claims 46 to 54 further comprising the steps of:
- a) calculating a direction; and
 - b) outputting data which indicates the direction calculated in step a).
- 25 56. A method of providing a graphical schematic of a location, the method comprising the steps of:
- a) calculating a direction;
 - b) generating a graphical schematic including information which indicates the
30 direction calculated in step a); and
 - c) outputting the graphical schematic.
57. A method according to Claim 55 or 56 wherein the information comprises a marker.

58. A method according to Claim 57 wherein the marker comprises an arrow.
59. A method according to any of Claims 55 to 58 wherein the graphical schematic includes a junction including an incoming road segment taken into the junction and an outgoing road segment taken out of the junction, and wherein the method includes the step of determining the angle between the incoming and outgoing road segments and selecting the information in step b) in accordance with the angle.
60. A method according to Claim 58 and 59 wherein the number of arrows included in the graphical schematic varies in accordance with the angle.
61. A method according to any of the preceding claims further comprising the steps of:
- a) determining the current position of the moon or sun; and
 - b) outputting data which indicates the current position of the moon or sun determined in step a).
62. A method of providing a graphical schematic of a location, the method comprising the steps of:
- a) determining the current position of the moon or sun;
 - b) generating a graphical schematic of the location, the schematic including information which indicates the current position of the moon or sun determined in step a); and
 - c) outputting the schematic generated in step b).
63. A method according to Claim 61 or 62 wherein the information comprises a marker.
64. A method according to Claim 63 wherein the position of the marker within the schematic is dependent on the current position of the moon or sun.

65. A method according to Claim 63 or 64 wherein the marker comprises a shadow image, the configuration of the shadow image being dependent on the current position of the moon or sun.
- 5 66. A method according to any of the preceding claims further comprising the steps of:
- a) receiving configuration data; and
 - b) generating the graphical schematic in accordance with the configuration data received in step a).
- 10 67. A method of providing graphical schematic data, the method comprising the steps of:
- a) receiving configuration data;
 - b) generating a graphical schematic in accordance with the configuration data received in step a); and
 - 15 c) outputting the graphical schematic generated in step b).
- 20 68. A method according to Claim 66 or 67 wherein the schematic is output to a device, and wherein the configuration data is indicative of a property of the device.
69. A method according to Claim 68 wherein the property is the screen resolution of the device.
- 25 70. A method according to any of Claims 66 to 69 wherein the configuration data is indicative of a user preference.
71. A method according to any of the preceding claims further comprising:
- a) selecting a network element from a database;
 - 30 b) selecting a point of interest from a database in accordance with a predetermined selection algorithm;
 - c) determining a geometrical relationship between the network element selected in step a) and the point of interest selected in step b);

- 5 d) generating an abstract representation of the point of interest in accordance with the geometrical relationship determined in step c);
- e) generating a graphical schematic including the set of network elements selected in step a) and the abstract representation of the point of interest generated in step d); and
- f) outputting the graphical schematic.
72. A method of providing a graphical schematic of a location, the method comprising the steps of:
- 10 a) selecting a network element from a database;
- b) selecting a point of interest from a database in accordance with a predetermined selection algorithm;
- c) determining a geometrical relationship between the network element selected in step a) and the point of interest selected in step b);
- 15 d) generating an abstract representation of the point of interest in accordance with the geometrical relationship determined in step c);
- e) generating a graphical schematic including the set of network elements selected in step a) and the abstract representation of the point of interest generated in step d); and
- 20 f) outputting the graphical schematic.
73. A method according to Claim 71 or 72 wherein the geometrical relationship relates to the visibility of the point of interest from the edge.
- 25 74. A method according to any of Claims 71 to 73, wherein the geometrical relationship relates to the apparent size of the point of interest from the edge.
75. A method according to any of Claims 71 to 74, wherein the geometrical relationship relates to the distance of the point of interest from the edge.
- 30 76. A method according to any of Claims 71 to 75 wherein the abstract representation of the point of interest comprises an abstract frontage of the point of interest, directed towards the edge.

77. A method of providing a graphical schematic of a location bounded by a defined geographical area, the method comprising the steps of:
- a) selecting one or more of points of interest falling outside the defined geographical area from the database;
 - 5 b) generating a graphical schematic of the defined geographical area, the graphical schematic including an indication of the direction of the point(s) of interest falling outside the defined geographical area; and
 - c) outputting the graphical schematic generated in step b).
- 10 78. A method according to Claim 77 wherein the graphical schematic also includes an indication of the distance to the point(s) of interest falling outside the defined geographical area.
- 15 79. A method according to any of the preceding claims wherein the graphical schematic includes first source data from a first source and second source data from a second source.
80. A method of providing a graphical schematic, the method comprising the steps of:
- 20 a) obtaining first source data from a first data source;
 - b) obtaining second source data from a second data source;
 - c) generating a graphical schematic including said first source data and said second source data; and
 - d) outputting said graphical schematic generated in step c).
- 25 81. A method according to Claim 79 or 80 including the steps of:
- a) identifying a first feature in the first data source;
 - b) identifying a second feature in the second data source;
 - c) determining whether the second feature overlaps with the first feature; and
 - 30 d) associating the second feature with the first feature if the second feature overlaps with the first feature.
82. A method according to any of the preceding claims wherein the data or schematic is generated by, processed by and/or output from a central server; the

method including receiving and displaying the data or schematic at a mobile client device.

5 83. A system for performing a method as claimed in any of Claims 1 to 82, the system comprising a central server configured to generate and output schematics to a mobile client device; and a mobile client device configured to receive and display the schematics.

10 84. A mobile client device adapted to receive or display data or a schematic generated by a method as claimed in any of claims 1 to 82.

15 85. Apparatus for generating data representative of a geographical network, using a database containing data representative of nodes and edges connected to such nodes, the nodes and edges being representative of the geographical network, and the apparatus comprising:

(a) means for selecting data from the database relating to an extended junction, which junction comprises at least one node and at least one edge, and

(b) means for outputting the selected data.

20 86. Apparatus for processing data representative of a geographical network, which network is formed from nodes connected by edges, comprising means for selecting an edge; means for analysing the portion of the network adjacent to the selected edge to determine whether the edge is an element of an artefact; and means for processing the selected edge in dependence on the result of the analysis.

25 87. Apparatus for processing data representative of a geographical network, the apparatus comprising:

a) means for retrieving the data from a database;

30 b) means for processing the data in accordance with a modification algorithm; and

c) means for outputting the processed data.

88. Apparatus for providing a graphical schematic of a location, the apparatus comprising:

- a) means for selecting one or more of points of interest from a database in accordance with a predetermined selection algorithm;
 - b) means for generating a graphical schematic including the selected points of interest; and
 - 5 c) means for outputting the graphical schematic.
89. Apparatus for providing a graphical schematic of a location, comprising:
- a) means for calculating a direction;
 - b) means for generating a graphical schematic including information which
 - 10 indicates the direction calculated in step a); and
 - c) means for outputting the graphical schematic.
90. Apparatus for providing a graphical schematic of a location, comprising:
- a) means for determining the current position of the moon or sun;
 - 15 b) means for generating a graphical schematic of the location, the schematic including information which indicates the current position of the moon or sun determined in step a); and
 - c) means for outputting the schematic generated in step b).
- 20 91. Apparatus for providing graphical schematic data, comprising:
- a) means for receiving configuration data;
 - b) means for generating a graphical schematic in accordance with the configuration data received in step a); and
 - c) means for outputting the graphical schematic generated in step b).
- 25 92. Apparatus for providing a graphical schematic of a location, comprising:
- a) means for selecting a network element from a database;
 - b) means for selecting a point of interest from a database in accordance with a predetermined selection algorithm;
 - 30 c) means for determining a geometrical relationship between the network element selected in step a) and the point of interest selected in step b);
 - d) means for generating an abstract representation of the point of interest in accordance with the geometrical relationship determined in step c);

- e) means for generating a graphical schematic including the set of network elements selected in step a) and the abstract representation of the point of interest generated in step d); and
 - f) means for outputting the graphical schematic.
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93. Apparatus for providing a graphical schematic of a location bounded by a defined geographical area, comprising:
- a) means for selecting one or more of points of interest falling outside the defined geographical area from the database;
 - 10 b) means for generating a graphical schematic of the defined geographical area, the graphical schematic including an indication of the direction of the point(s) of interest falling outside the defined geographical area; and
 - c) means for outputting the graphical schematic generated in step b).
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94. Apparatus for providing a graphical schematic, comprising:
- a) means for obtaining first source data from a first data source;
 - b) means for obtaining second source data from a second data source;
 - c) means for generating a graphical schematic including said first source data and said second source data; and
 - 20 d) means for outputting said graphical schematic generated in step c).
95. Apparatus according to any of claims 85 to 94, comprising a mobile device.
96. Apparatus according to Claim 95, further comprising a server connected to the
- 25 mobile device via a wireless network.
97. A mobile device adapted to carry out a method as claimed in any of Claims 1 to 82.
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98. A central server adapted to carry out a method as claimed in any of Claims 1 to 82, comprising means for communicating with a plurality of mobile devices.
99. A system comprising apparatus as claimed in any of Claims 85 to 94 and a mobile device.

100. A computer program product adapted to carry out a method as claimed in any of Claims 1 to 82.

5 101. A computer readable medium having stored thereon a computer program product as claimed in Claim 100.

102. A signal tangibly embodying a computer program product as claimed in Claim 100.

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103. A method of transmitting a signal as claimed in Claim 102.

104. A method substantially as described herein with reference to any of Figures 1 to 30B of the drawings.

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105. Apparatus substantially as described herein with reference to any of Figures 1 to 3, 18a, 18b and 18c of the drawings.